FORM PTO-1390 (REV. 5-93)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER **22750/543**
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S APPLICATION NO. (If known, see 37 CFR 1 5) **10/089911**
INTERNATIONAL APPLICATION NO. **PCT/EP00/08547**	INTERNATIONAL FILING DATE **(01.09.2000) 01 September 2000**	PRIORITY DATES CLAIMED **(05.10.1999) 05 October 1999**

TITLE OF INVENTION
HEEL LINING FOR THE SHOE INDUSTRY

APPLICANT(S) FOR DO/EO/US
WAGNER, Rudolf and GROTEN, Robert

Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S C 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U S C 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U S.C 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau)
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S C 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (Unexecuted)
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment
    ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment
14. ☒ A substitute specification and a Marked-up version of the Substitute Specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information. International Search Report together with an English translation and first page of the published International Application WO 01/25529.

EXPRESS MAIL NO. : EL327553880US

U.S. APPLICATION NO (if known, see 37 C.F.R.1.5) 10/089911	INTERNATIONAL APPLICATION NO PCT/EP00/08547	ATTORNEY'S DOCKET NUMBER 22750/543

10/089911 Rec'd PCT/PTO 04 APR 2002

17. ☒ The following fees are submitted.	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO $890.00		
International preliminary examination fee paid to USPTO (37 CFR 1 482) . . . $710 00		
No international preliminary examination fee paid to USPTO (37 CFR 1 482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $740.00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1 445(a)(2)) paid to USPTO $1,040 00		
International preliminary examination fee paid to USPTO (37 CFR 1 482) and all claims satisfied provisions of PCT Article 33(2)-(4) $100 00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	16 - 20 =	0	X $18.00	$	
Independent Claims	2 - 3 =	0	X $84.00	$	
Multiple dependent claim(s) (if applicable)			+ $280.00		

TOTAL OF ABOVE CALCULATIONS =	$ 890.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1 9, 1 27, 1.28).	$	
SUBTOTAL =	$ 890.00	
Processing fee of $130.00 for furnishing the English translation later the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +	$	
TOTAL NATIONAL FEE =	$ 890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +	$	
TOTAL FEES ENCLOSED =	$ 890.00	
	Amount to be: refunded	$
	charged	$ 890.00

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. **11-0600** in the amount of **$890.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO.

Kenyon & Kenyon
One Broadway
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SIGNATURE

Richard M. Rosati, Reg No. 31,792
NAME

04 April 2002
DATE

[22750/543]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Rudolf WAGNER et al.
Serial No.	:	To Be Assigned
Filed	:	Herewith
For	:	**HEEL LINING FOR THE SHOE INDUSTRY**
Art Unit	:	To Be Assigned
Examiner	:	To Be Assigned

Box PCT
Assistant Commissioner
for Patents
Washington, D.C. 20231
Attn: DO/EO/US

PRELIMINARY AMENDMENT AND
37 C.F.R. § 1.125 SUBSTITUTE SPECIFICATION STATEMENT

SIR:

Please, without prejudice, amend the above-identified application before examination, as set forth below.

IN THE SPECIFICATION AND ABSTRACT:

In accordance with 37 C.F.R. § 1.121(b)(3), a Substitute Specification (including the Abstract, but without claims) accompanies this response. It is respectfully requested that the Substitute Specification (including Abstract) be entered to replace the Specification of record.

IN THE CLAIMS:

On the first page of the claims, first line, change "What is claimed is:" to --WHAT IS CLAIMED IS:--

Please amend claims 1 to 16 as follows:

1. (Amended) A heel lining for the shoe industry, made up of a nonwoven fabric impregnated with a polymer, having a surface weight of 180 to 350 g/m^2, and tear propagation resistance values greater than 15 N in both the lengthwise and the crosswise direction, wherein the nonwoven fabric is made up of melt-spun, multi-component endless filaments, aerodynamically stretched and directly laid up to form a nonwoven material, having a titer less than 2 dTex, and wherein the multi-component endless filaments, after preliminary bonding, are split and bonded up to at least 90 % to produce supermicro endless filaments having a titer less than 0.2 dTex.

2. (Amended) The heel lining according to claim 1, wherein the multi-component endless filament is a bi-component endless filament of two incompatible polymers, said two incompatible polymers including a polyester and a polyamide.

3. (Amended) The heel lining according to claim 2, wherein the polyester portion of the multi-component endless filament is higher than the polyamide portion.

4. (Amended) The heel lining according to claim 3, wherein the weight ratio of the polyester portion to the polyamide portion in the multi-component endless filament is 1.1:1 to 3:1.

5. (Amended) The heel lining according to claim 2, wherein the multi-component endless filaments have a cross-section with an orange-like multi-segment structure, wherein the segments alternately contain one of the two incompatible polymers, in each instance.

6. (Amended) The heel lining according to claim 1, wherein the nonwoven fabric made of the multi-component endless filaments is pre-calandered for the purpose of preliminary prebonding.

7. (Amended) The heel lining according to claim 2, wherein at least one of the incompatible polymers that forms the multi-component endless filament contains an

additive, selected from a group consisting of dyeing pigments, permanently acting anti-statics and/or additives that influence the hydrophilic properties, in amounts up to 15 wt.-%.

8. (Amended) The heel lining according to claim 1, wherein the multi-component endless filament is not crimped.

9. (Amended) The heel lining according to claim 1, wherein the nonwoven fabric is impregnated with 20 to 50 wt.-% of a polymer, with reference to the starting weight of the nonwoven fabric.

10. (Amended) The heel lining according to claim 1, wherein a high-quality nubuck-like surface is formed after polishing due to ends of the microfilament being exposed at the surface.

11. (Amended) The heel lining according to claim 1, wherein one of the two sides of the heel lining is provided with an application of hot-melt glue.

12. (Amended) A method for the production of a heel lining, the method comprising the steps of:

spinning multi-component endless filaments from a melt;

aerodynamically stretching the multi-component endless filaments;

directly laying up the multi-component endless filaments to form a nonwoven material;

performing a prebonding step by one of calandering or needle-punching;

bonding the nonwoven fabric by high-pressure fluid jets;

simultaneously splitting the nonwoven fabric into supermicro-filaments having a titer < 0.2 dTex; and

impregnating the nonwoven fabric with a polymer.

13. (Amended) The method according to claim 12, wherein the steps of bonding and splitting the multi-component endless filaments includes the steps of alternately impacting the multi-component endless filaments from both sides with high-pressure water jets, several times.

14. (Amended) The method according to claim 13, wherein the steps of bonding and splitting the multi-component endless filament is performed on a unit with rotating screen drums.

15. (Amended) The method according to claim 12, wherein the step of impregnating the nonwoven fabric is performed with an aqueous polyurethane latex dispersion.

16. (Amended) The method according to claim 12, further comprising at least one of the steps of polishing and buffing.

REMARKS

This Preliminary Amendment amends without prejudice original claims 1-16 in the underlying PCT Application No. PCT/EP00/08547. The amendments conform the claims to U.S. Patent and Trademark Office rules, and do not add new matter to the application.

In accordance with 37 C.F.R. § 1.121(b)(3), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. § 1.121(b)(3)(iii) and § 1.125(b)(2), a Marked Up Version Of The Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) is respectfully requested.

The underlying PCT Application No. PCT/EP00/08547 includes an International Search Report, mailed December 14, 2000. The Search Report includes a list of documents that were uncovered in the underlying PCT Application. A copy of the Search Report accompanies this Preliminary Amendment.

The underlying PCT application also includes an amended International Preliminary Examination Report, dated December 6, 2001.

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,
KENYON & KENYON

Dated: Apr. 14, 2002 By: _____
Richard M. Rosati
(Reg. No. 31,792)

Version With Markings to Show Changes Made

1. (Amended) A heel lining for the shoe industry, made up of a nonwoven fabric impregnated with a polymer, having a surface weight of 180 to 350 g/m^2, and tear propagation resistance values greater than [>] 15 N in both the lengthwise and the crosswise direction, wherein [where] the nonwoven fabric is [being] made up of melt-spun, multi-component endless filaments, aerodynamically stretched and directly laid up to form a nonwoven material, having a titer less than 2 dTex [< 2 dtex], and wherein the multi-component endless filaments, after preliminary bonding, are split and bonded up to at least 90 % to produce supermicro endless filaments having a titer less than 0.2 dTex [< 0.2 dtex].

2. (Amended) The heel lining according to claim [Claim] 1, wherein the multi-component endless filament is a bi-component endless filament of two incompatible polymers, said two incompatible polymers including [particularly] a polyester and a polyamide.

3. (Amended) The heel lining according to claim [Claim] 2, wherein the polyester portion [proportion] of the multi-component endless filament is higher than the polyamide portion [proportion].

4. (Amended) The heel lining according to claim [Claim] 3, wherein the weight ratio of the polyester portion [proportion] to the polyamide portion [proportion] in the multi-component endless filament is 1.1:1 to 3:1.

5. (Amended) The heel lining according to claim 2 [one of Claims 1 to 4], wherein the multi-component endless filaments have a cross-section with an orange-like multi-segment structure, wherein [where] the segments alternately contain [containing] one of the two incompatible polymers, in each instance.

6. (Amended) The heel lining according to claim 1 [one of Claims 1 to 5], wherein the nonwoven fabric made of the multi-component endless filaments is pre-calandered for the purpose of preliminary prebonding.

7. (Amended) The heel lining according to claim 2 [one of Claims 1 to 6], wherein at least one of the incompatible polymers that forms the multi-component endless filament contains an additive, selected from a group consisting of [such as] dyeing pigments, permanently acting anti-statics and/or additives that influence the hydrophilic properties, in amounts up to 15 wt.-%.

8. (Amended) The heel lining according to claim 1 [one of Claims 1 to 7], wherein the multi-component endless filament is not crimped.

9. (Amended) The heel lining according to claim 1 [one of Claims 1 to 8], wherein the nonwoven fabric is impregnated with 20 to 50 wt.-% of a polymer, with reference to the starting weight of the nonwoven fabric.

10. (Amended) The heel lining according to claim 1 [one of Claims 1 to 9], wherein a high-quality nubuck-like surface is formed after polishing due to ends of the [, brought about by the] microfilament [ends] being exposed at the surface.

11. (Amended) The heel lining according to claim 1 [one of Claims 1 to 10], wherein one of the two sides of the heel lining is provided with an application of hot-melt glue.

12. (Amended) A method for the production of a heel lining, the method comprising the steps of [according to one of Claims 1 to 11, characterized in that]:

spinning multi-component endless filaments [are spun] from a [the] melt; [,] aerodynamically stretching the multi-component endless filaments; [stretched, and]

directly laying [laid] up the multi-component endless filaments to form a nonwoven material;

[a] performing a prebonding step [takes place] by one of calandering or needle-punching;

bonding [and] the nonwoven fabric [is bonded] by high-pressure fluid jets [and, at the same time,];

simultaneously splitting the nonwoven fabric [split] into supermicro-filaments having a titer < 0.2 dTex [dtex,]; and

impregnating the nonwoven fabric [subsequently impregnation] with a polymer [takes place].

13. (Amended) The method [process] according to claim [Claim] 12, wherein the steps of bonding and splitting [of] the multi-component endless filaments includes the steps of [takes place in that the pre-bonded nonwoven fabric is] alternately impacting the multi-component endless filaments [impacted] from both sides with high-pressure water jets, several times.

14. (Amended) The method [process] according to claim [Claim] 13, wherein the steps of bonding and splitting [of] the multi-component endless filament is performed [carried out] on a unit with rotating screen drums.

15. (Amended) The method [process] according to claim 12 [one of Claims 12 to 14], wherein the step of impregnating the nonwoven fabric is performed [impregnation is carried out] with an aqueous polyurethane latex dispersion.

16. (Amended) The method [process] according to claim 12 [one of Claims 12 to 15], further comprising at least one of the steps of [wherein subsequent treatment by] polishing and [or] buffing [is carried out].

[22750/543]

HEEL LINING FOR THE SHOE INDUSTRY

Specification

The invention relates to a heel lining for the shoe industry, and to a method for the production of the same.

In the shoe industry, particularly wear-resistant materials are used for lining the back part of a shoe, the so-called heel cap. These materials are supposed to absorb the forces that are exerted on the shoe by the foot, particularly during the flexing movement, in the longitudinal direction, for one thing, and for another, they must be able to withstand the friction forces that are caused in the shoe while walking, since the foot moves at least partially up and down within it. In order to prevent the foot from unintentionally slipping out of the shoe, a material similar to rough leather or suede is traditionally used as a heel lining, which prevents the foot from slipping out of the shoe by the effect of the friction between the lining and the foot or the lining and the wearer's sock or stocking.

In addition to heel linings made from natural materials, synthetic materials are also used. These synthetic materials are needle-punched nonwoven fabrics that are produced using the dry method, by crimping, and made of polyester, viscose, polyamide, or polypropylene fibers, or of mixtures of these fibers. For this purpose, fiber layers with a surface weight of up to 800 g/m^2 are laid down and mechanically consolidated by intensive needle-punching. This process step alone is very time-consuming and therefore relatively cost-intensive. It is generally followed by shrinkage of the needle-punched nonwoven fabric by hot air or steam, resulting in compaction of the material as well as further consolidation with regard to

adjustment of the density desired for the purpose of use. In order to achieve the necessary strength parameters such as tear resistance and tear propagation resistance of the needle-punched nonwoven fabric, the latter is impregnated with a latex binder dispersion that coagulates under the effect of heat, such as styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR) and subsequently dried. The latex proportion is about 30 to 60 wt.-% of the weight of the impregnated nonwoven fabric. The material prepared in this way is split into two to four thinner layers. This splitting process was taken over for nonwoven fabrics from the leather industry, in order to increase the productivity of nonwoven fabric production. The split products can be ground in order to make the surface uniform, or in order to improve the optical finish. Subsequently, a hot-melt glue is applied to one of the two sides, in order to simplify further processing. A disadvantage of the synthetic heel linings used until now has been, in particular, the very different strength values in the lengthwise and the crosswise direction, the loss in strength which occurs by splitting the fiber bundles that are arranged vertically as a result of needle-punching, and the lack of uniformity of the individual layers, caused by the position of the layers relative to the needle entry and exit side.

The invention has set itself the task of indicating a heel lining for the shoe industry that demonstrates tear resistance and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction, at surface weights of 180 to 350 g/m^2.

The invention has furthermore set itself the task of indicating a particularly suitable process for the production of such a heel lining.

This task is accomplished, according to the present invention, by a heel lining that is made up of a nonwoven fabric

impregnated with a polymer, with a surface weight of 180 to 350 g/m^2, and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction, where the nonwoven fabric is made up of melt-spun, aerodynamically stretched multi-component endless filaments, with a titer < 2 dtex, immediately deposited to form a nonwoven layer, and the multi-component endless filaments, after preliminary consolidation, are split by at least 90% to produce supermicro endless filaments with a titer < 0.2 dtex, and consolidated. These heel linings demonstrate high tensile strength and friction wear resistance values at low surface weight.

Preferably, the heel lining is one in which the multi-component endless filament is a bicomponent endless filament of two incompatible polymers, particularly a polyester and a polyamide. As a result, the multi-component endless filament demonstrates good splittability and a very advantageous ratio of strength to surface weight.

Preferably, the heel lining is one in which the polyester portion of the multi-component endless filament is higher than the polyamide portion, particularly in the range of a weight ratio of the polyester portion to the polyamide portion of 1.1:3 to 3:1. As a result, the heel linings demonstrate a very textile feel and good resistance to aging.

A heel lining in which the multi-component endless filaments have a cross-section with an orange-like multi-segment structure is particularly preferred, where the segments alternately contain one of the two incompatible polymers.

Preferably, the heel lining is one in which the nonwoven fabric made of the multi-component endless filaments is pre-calandered for the purpose of preliminary consolidation. This causes the material to demonstrate very good uniformity in thickness.

Furthermore, a heel lining in which at least one of the incompatible polymers that forms the multi-component endless filament contains an additive, such as color pigments, permanently acting anti-statics and/or additives that influence the hydrophilic or hydrophobic properties, in amounts up to 15 wt.-%, is particularly preferred. In this way, the heel lining can be positively influenced with regard to its resistance to fading, its tendency to become electrostatically charged, the transport of perspiration, or the effect of accumulated moisture. Furthermore, the addition of color pigments into the spinning mass makes it possible to produce dark colors, resistant to friction wear.

Furthermore, a heel lining in which the multi-component endless filament is not crimped is particularly preferred, since this ensures the textile feel that results from the good splittability into supermicro endless filaments.

A heel lining in which the nonwoven fabric is impregnated with 20 to 50 wt.-% of a polymer, with reference to the starting weight of the nonwoven fabric, is particularly preferred according to the invention. At comparable degrees of impregnation, the heel lining demonstrates superior strength properties as compared with the known synthetic heel lining materials.

It is advantageous if the heel lining is one in which one of the two sides is provided with an application of hot-melt glue. Such a material is particularly well suited for further processing on automatic machines.

The process according to the present invention, for the production of the heel lining, includes the steps that multi-component endless filaments are spun from the melt, aerodynamically stretched, and immediately deposited to form a nonwoven layer, that preliminary consolidation takes place by needle-punching or calandering, and that the nonwoven fabric

is consolidated by high-pressure fluid jets and, at the same time, split into supermicro endless filaments with a titer < 0.2 dtex, and subsequently impregnated with a polymer. The products obtained in this way are very uniform with regard to their strength, because the filament distribution in the product is isotropic, to a great extent. The products do not demonstrate any tendency towards delamination and demonstrate high modulus values as well as tear resistance and tear propagation resistance values.

Another advantageous further development of the process includes the step that consolidation and splitting of the multi-component endless filaments takes place in that the pre-consolidated nonwoven fabric is alternately impacted from both sides with high-pressure water jets, several times. This method of consolidation and splitting the multi-component endless filaments results in very dense nonwoven fabrics with smooth surfaces.

Preferably, consolidation and splitting of the multi-component endless filament is carried out on a unit with rotating screen drums. This form of the units permits the construction of very compact systems.

In particularly advantageous manner, impregnation of the nonwoven fabric, which has been predominantly split into supermicro endless filaments and consolidated, is carried out with an aqueous polyurethane or NBR latex dispersion. In this way, residues of solvent are avoided, and impregnation with the polymer is carried out in particularly environmentally friendly manner.

In preferred manner, the impregnated material is still subjected to subsequent treatment by grinding or buffing. With these measures, the surface consistency and the feel of the material obtained can be further improved. Because of the microfilaments contained in the structure, this results in a

particularly good and high-quality, nubuck-like surface, which is very similar to that of natural leather.

Example

A nonwoven fabric layer with a surface weight of approximately 160 g/m^2 is produced from a multi-component endless filament made up of 65 wt.-% poly(ethylene terephthalate) and 35 wt.-% poly(hexamethylene adipamide). The starting filaments have a titer of approximately 1.8 dtex and are made up of 16 segments, where polyester and polyamide segments alternate around a center axis, like orange wedges. The melt-spun multi-component endless filaments are aerodynamically stretched and deposited on a belt in random order. The nonwoven fabric layer obtained in this way is passed to a pre-calandering step at a temperature of approximately 95 °C and a pressure of approximately 100 bar. After mechanical pre-consolidation using needle-punching, water-jet treatment at a water pressure of approximately 100 bar takes place. Subsequently, splitting of the multi-component endless filaments into supermicro endless filaments with a titer of approximately 0.1 dtex and consolidation of the nonwoven fabric, using high-pressure water jets, take place. The treatment takes place twice from both sides, in each instance, at water pressures of 250 and 300 bar, and on screen bases with a mesh width of 60 to 100 mesh. The nonwoven fabric is subsequently dried and subjected to impregnation with polymer, using a wet-in-dry treatment with NBR latex. Approximately 125 wt.-% NBR are applied, with reference to the starting weight of the nonwoven fabric, and are fixed by drying at 180 °C. After grinding, a heel lining with a weight of 260 g/m^2 and a thickness of 0.75 mm is obtained.

Comparison Example

A nonwoven fabric is produced from polyester and polypropylene staple fibers, using intensive needle-punching, and it is impregnated with NBR. Splitting results in a heel lining with a surface weight of 320 g/m^2 and a thickness of 0.85 mm.

A comparison of the strength values and the friction wear resistance is shown in the following Table 1. In this connection, the friction wear resistance was determined in such a way that a sample body with a diameter of 90 mm was clamped into a rotation chuck head and stressed with a scrubbing pressure of 2.8 N/cm^2. The angle of rotation of the chuck head is 50 degrees. The test sample is tested against a scrubbing element that has a diamond pattern on its surface. The measurement sample is wetted with water and put into cyclic back-and-forth motion, where a scrubbing cycle is composed of 300 back-and-forth movements, followed by a visual assessment using a grading sample.

		Example	Comparison Example
Weight	g/m^2	260	320
Thickness	mm	0.75	0.85
Surface	Grade	1.0	1.0
10% modulus lengthwise	N / 5 cm	220	310
10% modulus crosswise	N / 5 cm	160	85
Tear propagation resistance lengthwise	N	21	10
Tear propagation resistance crosswise	N	21	10
Friction wear (according to WN 3147/1)	Grade	1.0	1.0-1.5

Table 1

What is claimed is:

1. A heel lining for the shoe industry, made up of a nonwoven fabric impregnated with a polymer, having a surface weight of 180 to 350 g/m^2, and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction, where the nonwoven fabric being made up of melt-spun, multi-component endless filaments, aerodynamically stretched and directly laid up to form a nonwoven material, having a titer < 2 dtex, and the multi-component endless filaments, after preliminary bonding, are split and bonded up to at least 90 % to produce supermicro endless filaments having a titer < 0.2 dtex.

2. The heel lining according to Claim 1, wherein the multi-component endless filament is a bi-component endless filament of two incompatible polymers, particularly a polyester and a polyamide.

3. The heel lining according to Claim 2, wherein the polyester proportion of the multi-component endless filament is higher than the polyamide proportion.

4. The heel lining according to Claim 3, wherein the weight ratio of the polyester proportion to the polyamide proportion in the multi-component endless filament is 1.1:1 to 3:1.

5. The heel lining according to one of Claims 1 to 4, wherein the multi-component endless filaments have a cross-section with an orange-like multi-segment structure, where the segments alternately containing one of the two incompatible polymers, in each instance.

6. The heel lining according to one of Claims 1 to 5, wherein the nonwoven fabric made of the multi-component

endless filaments is pre-calandered for the purpose of preliminary prebonding.

7. The heel lining according to one of Claims 1 to 6, wherein at least one of the incompatible polymers that forms the multi-component endless filament contains an additive, such as dyeing pigments, permanently acting anti-statics and/or additives that influence the hydrophilic properties, in amounts up to 15 wt.-%.

8. The heel lining according to one of Claims 1 to 7, wherein the multi-component endless filament is not crimped.

9. The heel lining according to one of Claims 1 to 8, wherein the nonwoven fabric is impregnated with 20 to 50 wt.-% of a polymer, with reference to the starting weight of the nonwoven fabric.

10. The heel lining according to one of Claims 1 to 9, wherein a high-quality nubuck-like surface is formed after polishing, brought about by the microfilament ends exposed at the surface.

11. The heel lining according to one of Claims 1 to 10, wherein one of the two sides is provided with an application of hot-melt glue.

12. A method for the production of a heel lining according to one of Claims 1 to 11, characterized in that multi-component endless filaments are spun from the melt, aerodynamically stretched, and directly laid up to form a nonwoven material; a prebonding takes place by calandering or needle-punching; and the nonwoven fabric is bonded by high-pressure fluid jets and, at the same time, split into supermicro-filaments having a titer < 0.2 dtex, and subsequently impregnation with a polymer

takes place.

13. The process according to Claim 12, wherein bonding and splitting of the multi-component endless filaments takes place in that the pre-bonded nonwoven fabric is alternately impacted from both sides with high-pressure water jets, several times.

14. The process according to Claim 13, wherein bonding and splitting of the multi-component endless filament is carried out on a unit with rotating screen drums.

15. The process according to one of Claims 12 to 14, wherein impregnation is carried out with an aqueous polyurethane latex dispersion.

16. The process according to one of Claims 12 to 15, wherein subsequent treatment by polishing or buffing is carried out.

Abstract

The invention relates to a heel lining for the shoe industry, in which the material is a nonwoven fabric impregnated with a polymer, with a surface weight of 180 to 350 g/m^2, and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction, where the nonwoven fabric is made up of melt-spun, aerodynamically stretched multi-component endless filaments, with a titer < 2 dtex, immediately deposited to form a nonwoven layer, and the multi-component endless filaments, after preliminary bonding, are split by at least 90% to produce supermicro endless filaments with a titer < 0.2 dtex, and bonded.

HEEL LINING FOR THE SHOE INDUSTRY

Field of the Invention

The present invention relates to a heel lining for a shoe, and to a method for the production of a heel lining.

Background of the Invention

In the shoe industry, particularly wear-resistant materials are used for lining the back part of a shoe, the so-called heel cap. These materials are supposed to absorb the forces that are exerted on the shoe by the foot, particularly during the flexing movement, in the longitudinal direction, for one thing, and for another, they must be able to withstand the friction forces that are caused in the shoe while walking, since the foot moves at least partially up and down within it. In order to prevent the foot from unintentionally slipping out of the shoe, a material similar to rough leather or suede is traditionally used as a heel lining, which prevents the foot from slipping out of the shoe by the effect of the friction between the lining and the foot or the lining and the wearer's sock or stocking.

In addition to heel linings made from natural materials, synthetic materials are also used. These synthetic materials are typically needle-punched nonwoven fabrics that are produced using the dry method, by crimping, and made of polyester, viscose, polyamide, or polypropylene fibers, or of mixtures of these fibers. For this purpose, fiber layers with a surface weight of up to 800 g/m^2 are laid down and mechanically consolidated by intensive needle-punching. This process step alone is very time-consuming and therefore relatively cost-intensive. It is generally followed by shrinkage of the needle-punched nonwoven fabric by hot air or

steam, resulting in compaction of the material as well as further consolidation with regard to adjustment of the density desired for the purpose of use. In order to achieve the necessary strength parameters such as tear resistance and tear propagation resistance of the needle-punched nonwoven fabric, the latter is impregnated with a latex binder dispersion that coagulates under the effect of heat, such as styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR) and subsequently dried. The latex proportion is about 30 to 60 wt.-% of the weight of the impregnated nonwoven fabric. The material prepared in this way is split into two to four thinner layers. This splitting process was taken over for nonwoven fabrics from the leather industry, in order to increase the productivity of nonwoven fabric production. The split products can be ground in order to make the surface uniform, or in order to improve the optical finish. Subsequently, a hot-melt glue is applied to one of the two sides, in order to simplify further processing. Some of the disadvantages of the synthetic heel linings used until now have been, for example, the very different strength values in the lengthwise and the crosswise direction, the loss in strength which occurs by splitting the fiber bundles that are arranged vertically as a result of needle-punching, and the lack of uniformity of the individual layers, caused by the position of the layers relative to the needle entry and exit side.

Description of the Present Invention

The present invention, in accordance with one embodiment, provides a heel lining for the shoe industry that demonstrates tear resistance and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction, at surface weights of 180 to 350 g/m^2.

The present invention also provides a particularly suitable process for the production of such a heel lining.

This task is accomplished, according to an exemplary embodiment of the present invention, by a heel lining that is made up of a nonwoven fabric impregnated with a polymer, with a surface weight of 180 to 350 g/m^2, and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction, where the nonwoven fabric is made up of melt-spun, aerodynamically stretched multi-component endless filaments, with a titer < 2 dtex, immediately deposited to form a nonwoven layer, and the multi-component endless filaments, after preliminary consolidation, are split by at least 90% to produce supermicro endless filaments with a titer < 0.2 dtex, and consolidated. These heel linings demonstrate high tensile strength and friction wear resistance values at low surface weight.

Preferably, the heel lining is one in which the multi-component endless filament is a bicomponent endless filament of two incompatible polymers, particularly a polyester and a polyamide. As a result, the multi-component endless filament demonstrates good splittability and a very advantageous ratio of strength to surface weight.

Preferably, the heel lining is one in which the polyester portion of the multi-component endless filament is higher than the polyamide portion, particularly in the range of a weight ratio of the polyester portion to the polyamide portion of 1.1:3 to 3:1. As a result, the heel linings demonstrate a very textile feel and good resistance to aging.

A heel lining in which the multi-component endless filaments have a cross-section with an orange-like multi-segment structure is particularly preferred, where the segments alternately contain one of the two incompatible polymers.

Preferably, the heel lining is one in which the nonwoven fabric

made of the multi-component endless filaments is pre-calandered for the purpose of preliminary consolidation. This causes the material to demonstrate very good uniformity in thickness.

Furthermore, a heel lining in which at least one of the incompatible polymers that forms the multi-component endless filament contains an additive, such as color pigments, permanently acting anti-statics and/or additives that influence the hydrophilic or hydrophobic properties, in amounts up to 15 wt.-%, is particularly preferred. In this way, the heel lining can be positively influenced with regard to its resistance to fading, its tendency to become electrostatically charged, the transport of perspiration, or the effect of accumulated moisture. Furthermore, the addition of color pigments into the spinning mass makes it possible to produce dark colors, resistant to friction wear.

Furthermore, a heel lining in which the multi-component endless filament is not crimped is particularly preferred, since this ensures the textile feel that results from the good splittability into supermicro endless filaments.

A heel lining in which the nonwoven fabric is impregnated with 20 to 50 wt.-% of a polymer, with reference to the starting weight of the nonwoven fabric, is particularly preferred according to the invention. At comparable degrees of impregnation, the heel lining demonstrates superior strength properties as compared with the known synthetic heel lining materials.

It is advantageous if the heel lining is one in which one of the two sides is provided with an application of hot-melt glue. Such a material is particularly well suited for further processing on automatic machines.

The process according to the present invention, for the production

of the heel lining, includes the steps that multi-component endless filaments are spun from the melt, aerodynamically stretched, and immediately deposited to form a nonwoven layer, that preliminary consolidation takes place by needle-punching or calandering, and that the nonwoven fabric is consolidated by high-pressure fluid jets and, at the same time, split into supermicro endless filaments with a titer < 0.2 dtex, and subsequently impregnated with a polymer. The products obtained in this way are very uniform with regard to their strength, because the filament distribution in the product is isotropic, to a great extent. The products do not demonstrate any tendency towards delamination and demonstrate high modulus values as well as tear resistance and tear propagation resistance values.

Another advantageous further development of the process includes the step that consolidation and splitting of the multi-component endless filaments takes place in that the pre-consolidated nonwoven fabric is alternately impacted from both sides with high-pressure water jets, several times. This method of consolidation and splitting the multi-component endless filaments results in very dense nonwoven fabrics with smooth surfaces.

Preferably, consolidation and splitting of the multi-component endless filament is carried out on a unit with rotating screen drums. This form of the units permits the construction of very compact systems.

In particularly advantageous manner, impregnation of the nonwoven fabric, which has been predominantly split into supermicro endless filaments and consolidated, is carried out with an aqueous polyurethane or NBR latex dispersion. In this way, residues of solvent are avoided, and impregnation with the polymer is carried out in particularly environmentally friendly manner.

In preferred manner, the impregnated material is still subjected to subsequent treatment by grinding or buffing. With these measures, the surface consistency and the feel of the material obtained can be further improved. Because of the microfilaments contained in the structure, this results in a particularly good and high-quality, nubuck-like surface, which is very similar to that of natural leather.

Example

A nonwoven fabric layer with a surface weight of approximately 160 g/m^2 is produced from a multi-component endless filament made up of 65 wt.-% poly(ethylene terephthalate) and 35 wt.-% poly(hexamethylene adipamide). The starting filaments have a titer of approximately 1.8 dtex and are made up of 16 segments, where polyester and polyamide segments alternate around a center axis, like orange wedges. The melt-spun multi-component endless filaments are aerodynamically stretched and deposited on a belt in random order. The nonwoven fabric layer obtained in this way is passed to a pre-calandering step at a temperature of approximately 95 °C and a pressure of approximately 100 bar. After mechanical pre-consolidation using needle-punching, water-jet treatment at a water pressure of approximately 100 bar takes place. Subsequently, splitting of the multi-component endless filaments into supermicro endless filaments with a titer of approximately 0.1 dtex and consolidation of the nonwoven fabric, using high-pressure water jets, take place. The treatment takes place twice from both sides, in each instance, at water pressures of 250 and 300 bar, and on screen bases with a mesh width of 60 to 100 mesh. The nonwoven fabric is subsequently dried and subjected to impregnation with polymer, using a wet-in-dry treatment with NBR latex. Approximately 125 wt.-% NBR are applied, with reference to the starting weight of the nonwoven fabric, and are fixed by drying at 180 °C. After grinding, a heel lining with a weight of 260 g/m^2 and a thickness of 0.75 mm is obtained.

Comparison Example

A nonwoven fabric is produced from polyester and polypropylene staple fibers, using intensive needle-punching, and it is impregnated with NBR. Splitting results in a heel lining with a surface weight of 320 g/m^2 and a thickness of 0.85 mm.

A comparison of the strength values and the friction wear resistance is shown in the following Table 1. In this connection, the friction wear resistance was determined in such a way that a sample body with a diameter of 90 mm was clamped into a rotation chuck head and stressed with a scrubbing pressure of 2.8 N/cm^2. The angle of rotation of the chuck head is 50 degrees. The test sample is tested against a scrubbing element that has a diamond pattern on its surface. The measurement sample is wetted with water and put into cyclic back-and-forth motion, where a scrubbing cycle is composed of 300 back-and-forth movements, followed by a visual assessment using a grading sample.

		Example	Comparison Example
Weight	g/m^2	260	320
Thickness	mm	0.75	0.85
Surface	Grade	1.0	1.0
10% modulus lengthwise	N / 5 cm	220	310
10% modulus crosswise	N / 5 cm	160	85
Tear propagation resistance lengthwise	N	21	10
Tear propagation resistance crosswise	N	21	10
Friction wear (according to WN 3147/1)	Grade	1.0	1.0-1.5

Table 1

Abstract

A heel lining for a shoe, in which the material is a nonwoven fabric impregnated with a polymer, with a surface weight of 180 to 350 g/m^2, and tear propagation resistance values > 15 N in both the lengthwise and the crosswise direction. The nonwoven fabric is made up of melt-spun, aerodynamically stretched multi-component endless filaments, with a titer < 2 dtex, immediately deposited to form a nonwoven layer. The multi-component endless filaments, after preliminary bonding, are split by at least 90% to produce supermicro endless filaments with a titer < 0.2 dtex, and are bonded.

[22750/543]

DECLARATION AND POWER OF ATTORNEY

As below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled **HEEL LINING FOR THE SHOE INDUSTRY**, the specification of which was filed as International Application No. PCT/EP00/08547, on 1 September 2000.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information that is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate filed by me on the same subject matter having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

(Number)	(Country)	(Day/month/year filed)	Priority Claimed Under 35 USC 119	
199 47 870.8	Fed. Rep. of Germany	**05 October 1999**	Yes X	No _

And I hereby appoint Richard L. Mayer (Registration No. 22,490) my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all communications regarding this application to:

KENYON & KENYON

26646

PATENT TRADEMARK OFFICE

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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